Name:____

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Geometry, Period_________

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Geometry Homework

Graphing Quadratics (using calculators) for Projectile Motion

Quadratic equations can be solved in many ways, including by factoring & by graphing. For example:

Solve by Factoring

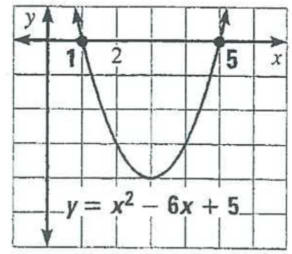
$x^2 - 6x + 5 = 0$

$(x - 1)(x - 5) = 0$

$x = 1$ *or* $x = 5$

Solve by Graphing

To solve $x^2 - 6x + 5 = 0$, graph $y = x^2 - 6x + 5$. From the graph you can see that the x-intercepts are 1 and 5.



To solve a quadratic equation by graphing, first write the equation in standard form, $ax^2 + bx + c = 0$. Then graph the related function $y = ax^2 + bx + c$. The x-intercepts of the graph are the solutions, or roots, of $ax^2 + bx + c = 0$.

1. Explain in your own words how the graph shows the same answer as the factors.

2. Check both answers by substituting each (one at a time) for x in the original equation:

I. check $0 = (1)^2 - 6(1) + 5$ II. $0 = (5)^2 - 6(5) + 5$

EXAMPLE 1 **Solve a quadratic equation having two solutions**

Solve $x^2 - 2x = 3$ by graphing.

Solution

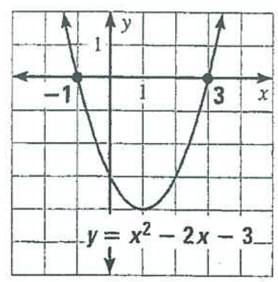
STEP 1 **Write** the equation in standard form.

$x^2 - 2x = 3$ **Write original equation.**

$x^2 - 2x - 3 = 0$ **Subtract 3 from each side.**

STEP 2 **Graph** the function $y = x^2 - 2x - 3$. The x-intercepts are -1 and 3.

▶ The solutions of the equation $x^2 - 2x = 3$ are -1 and 3.



CHECK You can check -1 and 3 in the original equation.

$x^2 - 2x = 3$	$x^2 - 2x = 3$	**Write original equation.**
$(-1)^2 - 2(-1) \stackrel{?}{=} 3$	$(3)^2 - 2(3) \stackrel{?}{=} 3$	**Substitute for *x*.**
$3 = 3$ ✓	$3 = 3$ ✓	**Simplify. Each solution checks.**

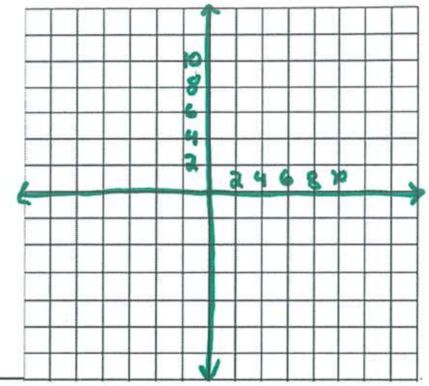
3. Can this problem also be solved by factoring? Show your work here:

Factor $x^2 - 2x - 3 = 0$

4. Could this quadratic represent projectile motion (an object that is thrown)? Why or why not?

5. Graph $y = x^2 - 4x + 7$. Sketch the graph to the right (be sure to draw & label the x & y axis):

6. Explain why the equation has no solution.



Let's break down the equation $h = -16t^2 + 12t + 4$ ← *The **4** is the initial height (feet) when it was thrown.*

***h** stands for height (ex: ft)* — ***12** is the initial speed (ft/sec). +12 means it was thrown upward.*

***t** stands for time (ex: sec)* — ***-16** is the coefficient for gravity on earth, if measured in ft/sec²*

A possible word problem for this equation:
Jena is 4 feet tall. If she threw a ball upward at 12 feet per second, how many seconds would it take to reach earth?

1. Graph on your calculator. You need to use x & y, so $y = -16x^2 + 12x + 4$
2. Sketch out the graph on your screen here, label #1→
3. What are the 2 solutions (x-intercepts)?

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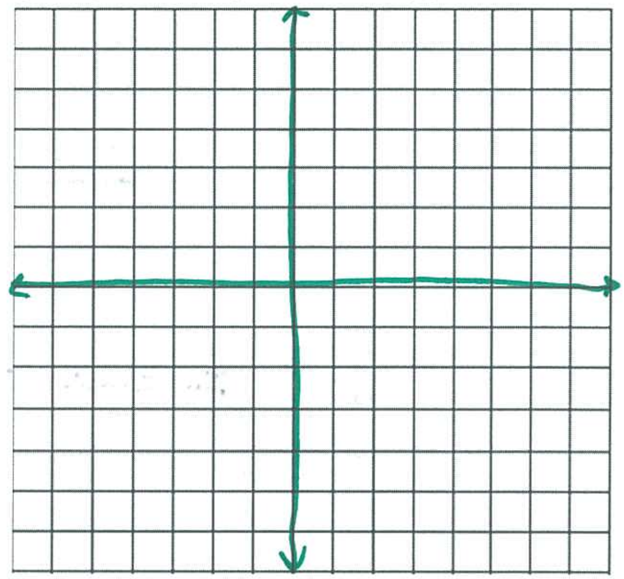
4. Which zero represents the time the ball hit earth? Why not the other one?



5. How would the graph look different if it was $y = -16x^2 - 12x + 4$ (minus 12x instead of plus 12x)? Sketch this on the same graph (label it #2).
   a. What does this mean about how the ball is thrown?______________________________
   b. What would the zeros be?______________________________
   c. Which one represents when the ball would hit the ground?______________________________
6. ~~How would the graph look different if it was $y = -16x^2 + 12x - 4$ (minus 4 instead of plus 4)? Sketch this on the same graph (label it #3).~~
   a. ~~Why does this make the original word problem impossible (2 reasons)?~~______________________________

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   b. ~~Explain the solution~~______________________________

If each equation below represents a thrown object, sketch the graph & write when it would hit the ground:

A) $h = -16t^2 + 5t + 9$	B) $h = -16t^2 - 5t + 9$	C) $h = -16t^2 + 9$	*~~1. Be sure to write the one solution under each graph. 2. What is the difference between how the ball was released (from a height of 9 feet) in graphs A, B, & C?~~*